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FINANCING SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

SUMMARY

How the growing scientific and technological needs of development, especially in developing countries may be financed, has been a matter of enduring concern to the Intergovernmental Committee. This subject was considered in the context of the establishment of the long-term, self-sustaining financing system envisaged in the Vienna Programme of Action on Science and Technology for Development, as well as a substantive theme at its session in 1986.

The end-of-decade review on the implementation of the Vienna Programme of Action brought into sharper focus the concept of endogenous capacity building as one of the future areas of concentration. The United Nations Fund for Science and Technology for Development, an integral part of the United Nations Development Programme, has not been able to attract the critical mass of core resources to make it sustainable. There is now a growing recognition of the importance of science-based technologies as critical inputs for accelerated growth and sustainable development. While, on the one hand, the multilateral resource base for endogenous capacity building in science and technology is diffused and, in relative terms, declining, there is, on the other hand, increasing awareness of its criticality. The decision to examine the possibility of organizing a more effective coalition of resources, in response to a new paradigm of development, is a consequence of this.

* A/CN.11/1991/1.

The report discusses the various issues involved in generating domestic resources to support endogenous capacity building in developing countries and examines various modalities such as national budgets, fiscal incentives, macroeconomic policies, financial intermediaries, national funds etc. It makes a brief review of the effectiveness of bilateral aid for science and technology and makes suggestions like setting target percentages of official development assistance to finance research and development in the recipient country. The principal focus of the report however is on multilateral resources and, in this context, it provides a framework for organizing a more effective coalition of resources for capacity building. In doing so, it reviews the experience gained in establishing the long-term financing system as envisaged in the Vienna Programme of Action as point of departure.

The report concludes that, given the increasing importance of financing activities related to endogenous capacity building in science and technology and the plurality of funding mechanisms, organizing a more effective coalition of resources is not only a possibility but a necessity if the concept of endogenous capacity building is to acquire operational credibility. Discussions with other potential participants in the coalition will be held after the Committee considers this paper and provides its guidance. A great deal of thought and work is required to make these ideas concrete and to transform them into a politically acceptable and substantively sound framework.

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INTRODUCTION

1. The Secretary-General was requested, by General Assembly resolution 44/14 and Intergovernmental Committee for Science and Technology for Development resolution 2 (X), to prepare a comprehensive report on financing science and technology for development and to explore the possibility of organizing a more effective coalition of resources within the United Nations system, multilateral financing institutions, regional development banks and bilateral funding agencies to strengthen the endogenous capacity building of developing countries in science and technology. In response, a combined report has been prepared with a programmatic focus on endogenous capacity building. The report also includes a section on the activities of the United Nations Fund for Science and Technology for Development.

2. Financing development needs in the 1990s is a major issue in the international economic agenda. With an overall insufficiency of capital and many competing demands, policy makers at the national and international levels are finding the task of priority setting and orderly allocation of resources extremely difficult. Although over the past 40 years, sizeable gross flows of about $US 600 billion to $700 billion were funneled from developed into developing countries through public means and over $500 billion through private funds, the real net flows have been estimated to be no more than about 35 per cent of gross amounts from public means. During the past five years, reverse net flows totalling $150 billion in debt service and a further $200 billion by way of capital flight have taken place, aggravating developmental problems. 1/ In 1989 alone, net outflow of resources amounted to $26 billion and, by the end of 1990, the total debt of developing countries amounted to $1,319 billion (A/45/273).

3. Because of the debt crisis, unwillingness of creditors to lend and the inability of debtors to absorb and service more debt, developing countries' external financing dropped from about $160 billion in 1981 to $68 billion in 1986, with the share of net private lending dropping from 57 per cent of the total in 1981 to only 4 per cent in 1986. A consequence of this situation is the greater willingness on the part of developing countries to welcome foreign investment, with attendant relaxation on domestic ownership requirements, more liberal trade and fewer bureaucratic regulations, as well as offering new fiscal incentives. 2/ As private lending has fallen precipitously, official loans and grants have risen from 31 per cent to developing countries' external finance in 1981 to 77 per cent in 1986, although in nominal terms this is only a small absolute increase. In real terms, official development assistance (ODA) to developing countries from industrialized country Governments has declined from $48.1 billion in 1988 to $46.7 billion in 1989 (by 2 per cent). In terms of ODA/GNP ratio, the 1989 figure was 0.33 as compared to 0.36 for 1988. 3/

4. As the International Development Strategy for the Fourth United Nations Development Decade states:

> "A solution to the debt problem, adequate resource flows and a supportive environment in the areas of international trade and commodity markets are among the prerequisites for the reactivation of development during the 1990s. But a sustained acceleration of the development process will not take place unless developing countries modernize and transform their industrial and agricultural sectors and participate in the progress made possible by advances in science and technology."

A prerequisite is the capacity to make informed and autonomous decisions on how and where to target and assimilate technology - imported or domestic - in the development process. Building such capacities, inter alia, needs sustained commitment, supported by specific resources.

5. The concept of endogenous capacity building, as distinct from indigenous development, is discussed in some detail in another document (A/CN.11/1991/4). The growing consensus that even access to and utilization of foreign technology needs a critical mass of domestic capacities needs to be deepened to include financing. The present paper concentrates on the issue of how, in the above setting, the needs of developing countries in science and technology are to be financed, oriented in particular towards endogenous capacity building.

I. PRESENT SITUATION

6. Buffeted and beset with issues of survival, many developing societies, particularly the least developed, find themselves on the horns of a dilemma: how to balance investments to meet immediate short-term needs without compromising important long-term imperatives such as endogenous scientific and technological development.

7. The crucial process of creating and strengthening the endogenous scientific and technological capacities of developing countries has not received the kind of sustained and strategic resource underpinning that could have made a difference to economic growth and development. While some developing countries have, in spite of a serious resource crunch, managed to mobilize significant financial resources for science and technology, many others have been unable to put in place the right policy package. International support to the efforts of developing countries has also remained diffused and disparate.

8. To illustrate, most developing countries have been unable even to mobilize 0.5 per cent of their gross national product towards research and development (not to speak of the quality of such investment), in comparison to over 2.5 per cent in many industrialized countries (Japan and the United States of America, 2.7 per cent and 2.5 per cent, respectively, in 1985). In global terms, the share of developing countries as a whole account for only 6 per cent of R&D expenditures. Transnational corporations, major conduits of modern technologies, have their primary R&D locus in their home countries. United States transnationals expend almost 90 per cent of R&D expenditures at

home, 9 per cent in other industrialized countries and 1 per cent in the developing countries, mostly for quality control and local adaptation. Although research and development is not synonymous with innovation or endogenous scientific and technological capacity per se, it still constitutes an important barometer. Furthermore, it is not often remembered that R&D is but a part, albeit an important part, of science and technology and that attention and resources are also required for other equally crucial elements, such as education, training, design capacity etc.

9. A major weakness and impediment in the early years after 1979 when the United Nations Conference on Science and Technology for Development was held at Vienna, was the lack of sufficient clarity about the evocative but elusive concept of endogenous capacity building in science and technology which, inter alia, led to a situation where even the modest amounts being channelled into science and technology in developing countries did not accelerate their endogenous capability building. Owing to the work of the Committee and decisions taken in recent years, there is now a much better understanding of the concept, in both intergovernmental and intellectual circles. The time is therefore now opportune to address the question of how to finance attendant activities.

10. The subject of financing science and technology has long been a topic of intergovernmental consideration and much work has been done, inter alia, by the intergovernmental Group of Experts on the United Nations Financing System for Science and Technology for Development and the Ad Hoc Group of the Whole. The expert group tackled the difficult issue of "gap" and level of funding required and opined that, based on a 3 per cent rate of growth of GNP, and on the assumption that developing countries would not be able to allocate more than 0.6 per cent of GNP for R&D by 1990, additional funding on the order of $5.4 billion would be needed by 1990 for R&D alone. It can easily be argued that such gross funds covering the developing world as a whole are of little practical use. None the less, they are useful as points of reference in assessing the order of magnitude of resource requirements.

11. This paper briefly analyses the current situation and concentrates on how to enhance and assemble the critical mass of resources necessary, not for science and technology at large, but for those activities that come within the foci of endogenous capacity building. In doing so, it is important to note that endogenous capacity building through science and technology has, indeed, as much, if not more, to do with policy-making, priority-setting, entrepreneurship and management as with science and/or technology per se. After all, endogenous capacity can be equated with the capacity to manage technological change.

II. MOBILIZATION OF RESOURCES

12. Excluding mechanisms such as the impact of market and taxation mechanisms on financing science and technology, as well as other incentives necessary to create a favourable climate for investing in science and technology, in particular research and development, this exercise primarily focuses on the mobilization of financial resources for the direct allocation of activities and programmes related to promote science and technology. Basically the paper deals with financing of science and technology from three intertwined angles: private and public, domestic and external, bilateral and multilateral with regard to the external financing.

Domestic resources

13. Developing countries as a whole have generated internally some 80 per cent of the total resources devoted to investment in general, the balance emanating from foreign aid and direct foreign investment. Note however should be taken that many of the smaller and least developed countries depend to a significantly larger extent on external resources for purposes of investment. In terms of GNP, aid constitutes a much smaller figure, amounting, on a net basis, for some countries to even less than 1 per cent. The burden that developing countries bear in financing their scientific and technological endeavours from their domestic resources is even higher, amounting to about 90 per cent of the investments.

Macroeconomic policies

14. A major problem that many countries face is the lack of a strong and sustained societal, particularly political and administrative, commitment along with an inability to reconcile macroeconomic management with technological development. Major economic, financial, taxation and regulatory policies in many countries act, perhaps unwittingly, as a deterrent to technical change and innovation. A major study of the Organisation for Economic Co-operation and Development (OECD), entitled Technical Change and Economic Policies (1980), showed how such policies act to shape the directions of technological change in either positive or negative ways. In some countries, while State-funded research laboratories develop processes for domestic production, customs and other laws allow free imports on one hand and local taxes are levied on domestic products. If developing countries are to succeed in their efforts to harness technology towards development, they should remove basic structural and policy impediments.

Science and technology policies

15. Science and technology policies, even in those countries where they are coherent, have largely remained as isolated adjuncts to socio-economic policies, leading at once to complacency and ineffectiveness. Experience has shown that mere formulation of science and technology policies does not ensure either the adequacy or the direction of science and technology efforts to raise productivity or to improve living standards. They need to be closely

dovetailed with economic policies and development plans. In their formulation and implementation, it is necessary to involve the widest possible stakeholders in the society.

16. Another important factor is that the State and the Government have been mobilizing almost 60 to 99 per cent of the funds. In contrast, the share of national R&D expenditures financed by the Government of Japan was only 22.2 per cent in 1983 and 46 per cent (including a large component of military R&D) in the United States. Of the estimated $108 billion that the United States is expected to spend this year on civilian R&D, the share of industry could be about $74 billion.

17. Although many developing countries have taken steps in recent years to increase the participation of the non-governmental sector, the share of the State still remains by far the preponderant portion. This is largely due to the nature of the economic structures in these countries, State control of large segments of the productive systems, inability or unwillingness of the private sector to invest in long-term and inherently risky ventures such as research and development and the overall absence of entrepreneurial risk-taking.

National budgets

18. Most scientific and technological activities in developing countries are undertaken by institutions belonging to the State sector and are therefore financed in the main by national budget. At the same time, the budgets lack transparency, and it is seldom possible to identify in the budget the totality of resources allocated to science and technology and the purposes for which these are utilized and, most of all, how they relate to national developmental objectives.

19. Being annual in nature, national budgets also are not suitable to science and technology projects and, in particular, those which are inherently long-term in their nature such as the endogenous capacity-building type of activities. Although the idea of a consolidated, single budget line devoted exclusively to science and technology has long been considered, most countries have not been able to introduce it. The time has come to consider if such a consolidated budgetary provision could be introduced for endogenous type of scientific and technological activities and not for all science and technology activities. This will facilitate greater transparency and mobilize budgetary resources towards endogenous capacity building as a manifestation of long-term commitment. But implementing it in practice would require the development of criteria and guidelines yet to emerge.

National funds

20. Many Governments have set up modalities such as consolidated national funds for science and technology, sectoral funds, functional or special purpose funds. These are designed to introduce a measure of continuity in funding and autonomy in operation. The means through which such funds are

financed vary from country to country, such as levels of specific taxes or cesses, either in an across-the-board or selective basis.

Financial intermediaries

21. In recent years, developing countries have come to acknowledge the fact that an entrepreneur that takes the inherent risks of innovation requires a far different kind of support than has been traditionally forthcoming. As a result, some of them have established financial intermediaries and venture capital funds that exist in those few countries that have sophisticated financial systems like Argentina, Brazil, India, Mexico, the Republic of Korea etc. The function of financial intermediaries such as national research development corporations is to act as a bridge between R&D institutions, end-users, financial institutions and design, engineering and consultancy firms. They function as conduits to provide risk finance for entrepreneurs by combining indigenous R&D with investment capital. Their performance has varied from country to country.

22. While there are those who argue that there is no additionality, many consider that a carefully calibrated package of incentives could make a difference when the risks are high and returns uncertain. Incentives include tax rebates, tax credits, tax holidays, customs exemptions etc. Since the public good is larger than private gain in R&D, and society stands more to benefit from the fruits of research than the researcher, many countries, including industrialized countries like the United States, have been offering incentives to support corporate R&D. Each developing country would need to design their own package in tune with their own needs and circumstances. They have to be selective, targeted and demand driven. The question is not "if" but "what" in order to allow the private sector to play a pivotal part in the process of providing endogenous capacities, particularly R&D.

23. In sum, while many developing countries acknowledge the indispensable role of science and technology as tools of accelerated growth and development, most have been unable to integrate the concept of endogenous capacity building into the very fabric of policy-making, programming and project formulation, encompassing not only the State but society as a whole; or to recognize that the subject of financing science and technology should not be seen as an exercise in the allocation of public funds but as an organized societal process of harnessing resources from all the stakeholders in the development process. This is especially relevant since the definition of the amount and kind of external resource support should evolve from the stakeholders' dialogue.

External aid

24. The place of external aid in development has been the subject of new thinking in recent years. No longer is it considered simply as a "gap-filling" activity. It is now generally considered that it triggers a multiplier effect, adds flexibility and, if properly targetted, could help stimulate stagnant economies. In science and technology in particular, aid

could help in obtaining access to advanced technologies and contribute to endogenous capacity building.

25. It has always been difficult to assess the volume of financial resources for science and technology for development by external donor agencies. One study, quoted by the Advisory Committee on Science and Technology for Development, in their report on their eighth session in 1988, estimated that the likely flow of financial support to science and technology - or more exactly, to research and development - in developing countries in 1984, was $2.4 billion, with more than half being directed to agriculture and rural development.

Bilateral resources

26. Bilateral aid has been the main component of ODA. In 1980, DAC (Development Assistance Committee of OECD) bilateral ODA amounted to about $18 billion. It increased in nominal terms to $30 billion in 1985 and $37 billion in 1986. The 1980s also saw a distinct preference towards bilateral ODA and in 1986, $27 billion out of $37 billion were channelled bilaterally by DAC countries. In 1989, out of $46.7 billion, $34.2 billion were bilateral. As a percentage of GNP, 0.24 per cent out of 0.33 per cent of DAC ODA in 1989 was accounted for by bilateral channels. 3/ Furthermore, bilateral aid of most donor countries is also focused on a few countries, consistent largely with perceived strategic considerations or historical connections.

27. It is in this setting - and the reversal in the debt-related transfers and decline in other private financial flows - that the issue of bilateral aid for science and technology needs to be reviewed. Science and technology, particularly research and development, have been a component of bilateral aid from DAC countries for over three decades. Other components are scientific and technical education and training and scientific and technological services. University exchanges are also an important part of scientific and technological cooperation with development countries. Scientific and technological forms of cooperation for development provided by OECD countries is essentially of two types:

(a) Those intended to help developing countries increase their research activities and institutions that allow these activities to be focused towards meeting urgent socio-economic problems;

(b) Those intended to bring part of the research potential of the industrialized societies to bear on programmes and projects designed to solve the crucial technical problems of developing countries which they themselves are not in a position to solve for the time being.

From a sectoral point of view, highest priority for R&D expenditures for development is given to agriculture and food; medicine and public health have second priority, followed closely by natural resources or energy.

28. The modalities for channelling bilateral aid for science and technology vary from country to country. Some of them have created specific publicly-funded autonomous institutions such as the Swedish Agency for Research Cooperation with Developing Countries (SAREC) of Sweden, the International Development Research Centre (IDRC) of Canada, the Australian Centre for International Agricultural Research (ACIAR), the Research and Evaluation Division of the Norwegian Agency for International Development (NORAD) etc. Some others like the United States Agency for International Development (AID) have, through the creation of a new post of Senior Assistant Administrator for Science and Technology and an Office of the Science Adviser, sought to energize support for science and technology. Other countries, such as Japan and the United Kingdom, rely on decentralized structures and on existing aid mechanisms.

29. In the early 1980s, the contribution of DAC countries to R&D activities for developing countries according to OECD, expressed by using purchasing power parities, totalled about $700 million, corresponding to about 0.4 per cent of the gross domestic expenditure on R&D of all OECD countries. Such an expenditure is estimated to correspond to about 2 per cent of ODA. The estimated amount for science and technology as a whole for developing countries was about $1.8 billion. 4/

30. Since science and technology pervade most areas of bilateral aid, it is difficult to segregate scientific and technological aid separately from ODA. An attempt should however be made to define the processes by which science and technology aid could contribute to the ultimate targets of development and increase the extent to which local scientists and institutions are associated with science and technology research work that is supported by bilateral aid. Direct links between specific developed country and developing country institutions, including training, could greatly enhance the effectiveness of bilateral aid. Aid-funded research in developing countries should use local resources and local personnel, encourage local development of technology appropriate to local conditions and become more demand driven. Greater attention should also be given to "software" aspects, such as maintenance and modernization. A shift away from "science push" of R&D towards demand "pull" of industry could contribute to the process of capacity building. As recommended by the South Commission, a link should be established between total international aid and aid for science and technology. One way might be for donor countries to agree to provide a fixed percentage of their ODA as an additional sum to finance R&D activities in the recipient country.

31. It is clear that, without the full cooperation of the bilateral donors, the goal of mobilizing the critical mass or a coalition of resources for financing science and technology, and especially for endogenous capacity building, cannot be reached.

Multilateral resources

32. Multilateral development financing, primarily a phenomenon of the last four decades, has increasingly come to play a prominent place in the endeavours of developing countries to accelerate their pace of economic growth and development. Although dwarfed by private flows to developing countries and bilateral aid, multilateral financing, particularly of the concessionary type, have become irreplaceable in the development context. They are generally acknowledged to be more catalytic, strategic, non-conditional and more responsive to national priorities. Furthermore, multilateral resources, properly used, add flexibility and adaptability to otherwise rigid and inflexible economies. Their universality touches far more countries than bilateral aid.

33. Multilateral development financing in terms of percentages, accounted for under 9 per cent of total developing country receipts in 1970, rose to 13 per cent in 1980 and to over 20 per cent in 1985 (A/45/273). Multilateral ODA has now reached an annual level of $12.5 billion, about one third of which is in the form of technical cooperation. 3/

The World Bank

34. Disbursements from the World Bank grew dramatically from about $500 million in 1970 to over $7.5 billion in 1983 and to over $10 billion in 1986. Net transfers, however, have tapered off from a peak of just under $6 billion in 1984 to about $3 billion in 1986/87. Between 1970 and 1983, net disbursements of the three major regional development banks, Asian, African and Latin American, grew from $300 million to about $2.5 billion. Since 1983, growth in almost all sources of multilateral financing has leveled off or declined substantially, especially in net resource transfer terms. What is sometimes termed as "aid fatigue" particularly pertains to multilateral concessional resources. 1/

35. It is important to bear in mind the broad multilateral development finance setting in considering aid for science and technology. Aid for science and technology pervades most of multilateral aid, albeit, in a largely implicit manner. From 1975 to 1984, the World Bank lent about $2 billion to the Governments of developing countries to help them to reorganize and recoup their national agricultural research and extension systems, about $1 billion for scientific and technological education, $1.4 billion for project-related training and $118 million to promote innovation in industrial enterprises, including provision of venture capital. The Bank has several unique advantages for its work in science and technology. As a major multilateral financial institution, the Bank can mobilize resources in the capital markets and apply them to development on the basis of demand for financing viable projects. In addition, it has influence and an overview of the problems of development. It can help build local technological capacity as a component of major investment projects. It can finance a scaling up of successful innovations and it can plan and fund large-scale research on critical global problems. It can facilitate interfacing of science and technology policies

with macroeconomic management. It can influence national policies to encourage research, innovation and more appropriate choice of technology in a manner that is directly contributory to endogenous capacity building.

36. The time is now opportune, given the range and pace of technological change and its impact on development, for the Bank to consider, as a core element of its policies, supporting the efforts of developing countries to enhance their endogenous capacity. The Bank could, for instance, consider introducing the concept of endogenous capacity building into the structural adjustment programmes, and support ECB efforts through concessional financing and technical assistance. The Bank should also consider lending more for research, development and pilot tests and provide grants to research on issues of broad potential relevance to development. A not too close parallel is the Bank's role in setting up the Consultative Committee on International and Agricultural Research (CGIAR). The Bank should strengthen its in-house capabilities so as to build into its decision-making apparatus an element of concern about science and technology. The Bank could also consider injecting the dimension of technological appropriateness into the project cycle, starting from conception, to formulation, to execution, to monitoring, to evaluation, on the lines of its recent effort in regard to environment. The Bank's first annual report on "The World Bank and Environment" is an instructive example of what can be done for science and technology if there is similar support.

37. A commitment on the part of the Bank and allocation of commensurate resources is unlikely unless Member States themselves advocate the cause of science and technology in the governing organs of the Bank.

Regional development banks

38. Regional development banks, particularly the three main regionals, namely, the African, Asian and Inter-American Development Banks, are expected to play a strong role in development finance in the 1990s. These banks have grown significantly in their financial capacity and account for a larger volume of net non-concessional transfers than the World Bank at present, though their combined concessional transfers are about half the level of IDAs ($1.5 billion). In addition to the three, there are also smaller subregional institutions such as the Caribbean, South Pacific and Islamic Development Banks. Together, they constitute significant sources of funding for developing countries, and the issue of their role in science and technology and in strengthening endogenous capacities of developing countries needs to be considered.

39. The regional development banks, with perhaps the exception of the Inter-American Development Bank, have been, in the past, somewhat reluctant to directly support science and technology, as their loan portfolios indicate. Other regional development banks such as the Asian Development Bank and the African Development Bank have also, in recent years, come to pay greater attention to science and technology and are supportive of the efforts of developing countries in this respect. Gradually, most development banks are

grasping the fact that they play a key role in technology choice and transfer. Much remains to be done, particularly in injecting the dimension of technological appropriateness and endogenous capacity building as an integral element in the project cycle so that decision makers become aware of the full societal implications of technology funded by these banks. This is why it is so important that the banks give direct support to ECB efforts in developing countries.

40. It is thus necessary to introduce technological advocacy in their decision-making process and one way of ensuring that is to have a distinct organizational focus in their secretariats. These banks should also consider allocating a certain portion of their concessional resources for the direct support of endogenous capacity building in science and technology in their member countries. The representatives of developing countries in the governing organs of these banks should take the lead, demonstrating that they attach high priority for science and technology and that they are prepared to make appropriate adjustments in the allocation of resources.

Resources from the United Nations system

41. The United Nations system, excluding the World Bank and including organizations such as the United Nations Children's Fund (UNICEF), the United Nations Conference on Trade and Development (UNCTAD), the United Nations Development Programme (UNDP), the United Nations Population Fund (UNFPA), the International Labour Organisation (ILO), the Food and Agriculture Organization of the United Nations (FAO), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the World Health Organization (WHO), the United Nations Industrial Development Organization (UNIDO) etc. play a large and crucial role in their respective sectors of specialization in channelling and disbursing external financial resources for development. Multilateral funds available to developing countries through the United Nations system, exclusive of the World Bank group, amount to barely one half (an estimated $1.7 billion per year) of technical cooperation funding. Of these, UNDP accounts for about $900 million annually. While these resources comprise a mere 2 per cent of the total ODA, they nevertheless represent a major share of the funds available for United Nations system technical cooperation activities.

42. Specialized agencies such as UNESCO, ILO and FAO finance their scientific and technological activities from their regular budgets as well as through extrabudgetary resources provided by organizations like UNDP, UNFPA etc. They also support science and technology through trust funds made available by donor countries. How much the United Nation system as a whole spends on science and technology in developing countries, and with what effect, has been a topic of long-standing study in the United Nations.

43. Largely due to the difficulty to decide what to include and what to exclude and the pervasive scope of science and technology, it has been difficult to quantify the totality of resources. Inter-agency missions to selected developing countries (Jordan, Nepal, Thailand) attempted to quantify the amounts spent by the United Nations system in those countries but faced

similar problems. It was found to be very difficult to collate such disparate activities and, since the impact of agencies' activities are measured in terms of project objectives, it was not possible to assess ex post facto their contribution to technological development. The latest attempt in this respect, namely, the Cross-Organizational Review of the Medium-Term Plans and Programme Analysis in Science and Technology for Development of 1987, tried to get around the problem by differentiating science and technology activities into core and programme activities. Core activities were defined as those entirely and directly related to science and technology for development, and component activities as those only partially related.

44. It was estimated that during the years 1984-1985 approximately 35 per cent of subprogrammes that address the issue of science and technology for development were core activities. A total of 1,225 technical cooperation projects were reported in 110 countries, of which around 61 per cent were reported as core. Four hundred and seventy-six technical cooperation projects were reported as having the component of science and technology for development. The United Nations, notably the regional commissions, reported the largest number, 41 core activities, with a total cost of some $21 million. Most specialized agencies reported core programmes (112 in all) with a total cost of $337 million. UNESCO reported the largest number among agencies (22 per cent) and WHO the most resources (36 per cent). Among other agencies, more than half of ILO's subprogrammes and most of WIPO's were considered as core. The majority of its activities (288 subprogrammes) analysed were components of subprogrammes directed towards other development objectives.

45. The multitude of figures underscores how complex it is to draw inferences on the impact of science and technology activities - implicit and explicit - on economic development. It underlines the need to introduce a narrower frame of reference, such as endogenous capacity building. An earlier study, namely, the "efficiency study", prepared for the consideration of the General Assembly at its thirty-sixth session, attempted this task and came to the conclusion that, out of a total United Nations official development assistance of $2.2 billion, excluding the World Bank, the resources committed to endogenous capacity in science and technology were on the order of 8 to 10 per cent only.

46. UNDP estimates that roughly 20 per cent of its technical assistance goes towards support of science and technology. Most of it is subsumed in sectoral development, and it is difficult to make any impact assessment. Considering that the bulk of the technical cooperation activities in the United Nations system are funded by UNDP, and since a separate financing system for science and technology has not materialized, it is important that the resources of UNDP play a larger and more direct role in financing science and technology, particularly in support of endogenous capacity building. An analogy could be its work in regard to the formulation of environmental guidelines which were considered by the Governing Council of UNDP at its thirty-seventh session in June 1990. UNDP has included in the checklist of project appraisal subjects like impact on environment, integration of women in development, technical cooperation among developing countries etc., but not impact of technology on development. Such a step, if introduced, could go a long way towards

integrating technological variables into sectoral development and ensuring that the extrabudgetary resources that countries contribute to UNDP as the central funding mechanism, will contribute, if properly targeted, to technological development.

47. The United Nations system at large has not been successful in attracting the necessary resources for science and technology, as anticipated at the Vienna Conference in 1979. Whether this was due to general donor fatigue or to conceptual difficulties in separating science and technology activities convincingly from sectoral development activities is still open to discussion. The fact remains that significant resources mobilization never materialized. The first victim of this situation has been the United Nations Financing System for Science and Technology for Development. This funding entity was one of the four institutions created by the Vienna Conference. After a very successful first year in terms of financial contributions, the Financing System never again received sufficient funds which would have been commensurate with its task as the central funding body in science and technology in the United Nations system; it was terminated as of 31 December 1986 and its responsibilities were transferred to the United Nations Fund for Science and Technology for Development (UNFSTD) which, by General Assembly resolution 41/183 of 8 December 1986, was placed within UNDP. This integration within UNDP was expected to provide a more secure setting for the Fund but at the same time it gave a clear signal to the donor community that a significant growth in core contributions could not be expected. The history of the Fund has so far proven that the small funds within UNDP are not very attractive as far as core contributions are concerned while there is a much wider potential for non-core contributions, i.e. cost-sharing and trust-fund arrangements. Indeed the Fund has been quite successful in obtaining co-financing from countries such as France, Germany,* Italy, Japan and Norway. An analysis of programmes and projects funded makes it clear that the interest of those donors has not been so much the securing of markets for their own services and equipment, as for the desire to participate in a specific science and technology theme, rather than in science and technology per se. Technology information and information technology (including computer technology) covered the largest area of support, followed by science and technology policies, remote sensing and maintenance of scientific instruments. While some of the donors considered the possible feedback for their own markets - although a formal link is ruled out according to UNDP rules and regulations - other donors explicitly excluded interest in such a link. Three lessons can be drawn from this experience for future funding mechanisms and the Fund's role in them:

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* Through accession of the German Democratic Republic to the Federal Republic of Germany with effect from 3 October 1990, the two German States have united to form one sovereign State. As from the date of unification, the Federal Republic of Germany acts in the United Nations under the designation of "Germany".

(a) Countries that are reluctant to make core contributions to small funds either because of reasons of principle or for pragmatic considerations are clearly more easily inclined to consider non-core contributions;

(b) Experience does not necessarily support the often stated observation that non-core contributions are more interested and less neutral;

(c) Donors often prefer specific programmes and projects to non-specific contributions; this is a strong incentive for them to support non-core activities.

48. The annex to this document provides brief information on the activities of the Fund.

III. NEW FINANCING CONCEPT: COALITION OF RESOURCES

49. Experience gained over the past decade in mobilizing financial resources for scientific and technological activities has reinforced the need to preserve plurality. The extant multilateral financing institutions have obviously to play a stronger but targeted role in the future. That, however, is not sufficient to impart sufficient momentum to the painstaking process of endogenous capacity building. That requires specificity and distinctiveness. Before attempting to delineate the contours of the concept, it is important to draw the right lessons from the abortive efforts to create a long-term, self-sustaining, off-the-shelf financing system for science and technology for development as envisaged in the Vienna Programme of Action.

50. These can be summarized as follows:

(a) Support has to be universal, inclusive of all the major donor countries. Though some of the donor countries might be sympathetic to the objectives, they remain reluctant to commit resources in the absence of balanced burden sharing within the donor community itself;

(b) Resources that developing countries themselves could mobilize, tantamount to a political statement, cannot reach the "critical mass" level;

(c) It is difficult to interest many countries in pledging resources to something as generic as science and technology. A more clearly defined programmatic focus is necessary to provide the confidence and credibility that the resources would be utilized for realistic and concrete objectives;

(d) It is important to establish a clear conceptual and operational differentiation between the activities to be supported by any new modality and those that have been traditionally supported by well-established funding bodies such as UNDP;

(e) In the prevailing political and economic environment, it is not possible to replicate modalities such as IDA of the World Bank or the

International Fund for Agricultural Development (IFAD); contributions to any new mechanisms can only be wholly voluntary in nature;

(f) The architecture of any new arrangement should avoid creating a new and large bureaucracy to manage meagre resources.

51. It is essential to avoid the above pitfalls in the design and frame of any new modality for financing science and technology. The following considerations should be borne in mind in any new paradigm:

(a) The programmatic focus should be endogenous capacity building of developing countries in science and technology based on commonly accepted and clearly defined criteria. That such a focus is likely to be attractive to the donor community is evidenced by the fact that some of the major donor countries, such as Germany, Japan and Switzerland, have supported the pilot projects on endogenous capacity building in selected developing countries through trust funds during the past two or three years;

(b) Many donor countries are currently engaged in supporting science and technology in developing countries and, implicitly, endogenous capacity building, with very little coordination among themselves, creating vertical - and not always healthy - linkages between the donor organizations and institutions and organizations in the developing countries. Little, if any, horizontal coordination takes place either among the donor countries or the recipient institutions in the developing countries. As noted by the Expert Meeting on the Role of Science and Technology in Development Cooperation with the Less Advanced Developing Countries in the 1990s, "a strategic capacity building approach requires much more effective coordination between aid agencies in the field" (DCD/DAC(90)39). 5/

52. The intellectual challenge would be to design a flexible and pragmatic structure with a clear programmatic focus that draws upon a coalition of domestic and external resources from interested donor countries and institutions.

53. A major point of departure for the coalition would be that it included domestic resources. There is a growing feeling that organic integration of domestic and external resources in support of concrete programmes is mutually beneficial and will optimize scarce resources. Strict separation has often led to underutilization, waste and to a flow of external resources in support of activities that are demonstrably not of highest priority. It also takes into account the fact that external financing often is donor driven. Given the dynamics of domestic funding and external aid, this is a difficult task and has to be carefully thought through. One way could be to provide that the resources from such a coalition would be made available only to those countries that provided resources to a certain percentage, perhaps 25 per cent (except least developed countries who might be required to make a token contribution). The resources made available by the concerned countries could be integrated at the country level and earmarked to specific projects by the round tables chaired by the United Nations resident coordinator/resident

representative. Project proposals submitted for support from the coalition would be cleared by the round table with a clear indication of the domestic component. The precise modalities would need to be carefully worked out if there was agreement in principle.

54. The most important feature of such an approach is the process that precedes the interaction with the coalition of resources. This is the stakeholders' dialogue process which achieves a consensus about future priorities and initiatives in science and technology for development. The stakeholders should include those constituencies in society that would be mostly affected by technological change.

55. Another feature would relate to the nature of projects to be funded. A large part of external aid has hitherto been oriented towards the financing of infrastructure, physical facilities, plant and machinery, i.e. hardware, to the relative neglect of investment in human capital, training and skills to operate, maintain and adapt technology. It is to these "software" aspects that the funds would be targeted in the context of endogenous capacity building.

56. The organized coalition of resources could function at two levels: global and national. At the global level, it could take the institutional form of an informal association of like-minded donors, bilateral as well as multilateral, including the World Bank, UNDP, regional development banks and international foundations and major bilateral donor organizations such as SAREC, IDRC etc. The association would meet once a year: (a) to mobilize and collate resources; (b) to allocate resources to specific projects submitted by developing countries; and (c) to monitor the progress and execution of projects.

57. A small executive board of seven members (from donors and from the recipient countries) would meet twice a year to oversee the work of the association. The secretariat would be provided jointly by the Centre for Science and Technology for Development and the United Nations Fund for Science and Technology for Development.

58. The resources of the association would be strictly utilized to fund, not generic science and technology activities, but those that were demonstrably designed to build endogenous capacities of developing countries in science and technology based on specific criteria to be approved by the executive board and the association.

59. Projects would be financed either through a single contributory source or a combination of sources. Financial support would be provided in the form of grants or soft loans for the duration of a project. Aid could take the form of co-financing or joint financing.

60. A major activity of the coalition would be to finance the portfolio of prioritized activities that arose out of the endogenous capacity building pilot projects through dialogues among the stakeholders in the development

process. Such a process would help to identify the priority needs in a country and to better understand the role of science and technology in responding to the development needs as well as contribute to a more effective use of external assistance as a supplement to domestic efforts.

61. At the national level, the present modality of a round table of the donor community would be used and extended to the project. It would scrutinize the proposals submitted by the concerned countries to ensure that those projects conformed to the guidelines relating to their character as endogenous capacity building types of activities. The precise functions of the round table would need to be more clearly detailed.

62. An organized coalition of resources of this nature would ensure that the resources of the donor community, balanced and supplemented each other and were channelled specifically towards activities truly directed towards endogenous capacity building. Such a mechanism would not in any way duplicate or replace any of the existing funding bodies in or outside the United Nations system and the resource requirements would also be rather modest, since activities would not be expected to be capital-intensive, requiring the purchase of costly equipment or the setting up of large research laboratories and facilities.

63. At any rate, it wold be crucial that the interactions with the coalition of resources were preceded by the participatory decision-making process of the stakeholders' dialogue type. Otherwise, the shift from donor-driven to country-driven development assistance would be delayed.

64. The concept of a coalition and the way in which resources would be used also responds to often repeated criticisms about aid; that project aid is biased towards capital and foreign exchange expenditures to the neglect of operating, recurrent and local costs; that annual budgetary allocations do not provide the continuity that is needed; that aid is dissipated due to lack of coordination among different donors; that donors are often interested in direct and visible outputs at the expense of long-term sustained development.

65. The above outline presents an innovative, flexible and pragmatic modality designed to respond at once to the current financial realities and the growing substantive need. The emphasis is on "qualitative addition", not on any large "quantitative increase" in the total aid. It would enhance the developmental quality of existing aid. Much remains to be done to elaborate on the details and to plug many loopholes that might surface on closer scrutiny. After the Committee gives its consideration to the concept/framework, the Centre, in close cooperation with the United Nations Fund for Science and Technology for Development, would try to prepare a more comprehensive blueprint with the help of experts drawn from within and outside the United Nations system. A meeting of interested donors would be called to seek their views and suggestions before proceeding any further. Consultations with United Nations funding bodies, such as the World Bank and UNDP, have not been held since it was felt premature to do so, bearing in mind the fact that what the Committee requested,

at this juncture, is an examination of the possibility of a more effective organizational coalition of resources.

66. It is important however to note that at the OECD Expert Meeting on the Role of Science and Technology in Development Cooperation with the Less Advanced Developing Countries in the 1990s (May 1990), the need for closer aid coordination was emphasized. Inter alia, the report noted that aid agencies should increasingly shift from a project-by-project approach to a more strategic capacity building thrust, and that such an approach required much more effective coordination between aid agencies in the field. 5/

67. In sum, no single source - bilateral or multilateral - can fill the existing void and, given the reality of diminishing resources, only through a pooling of funds from like-minded donors can a critical mass of resources be mobilized. An organized coalition of resources is necessary to meet the challenge of stimulating endogenous capacities in science and technology in developing countries. Such a coalition will also be in line with the conclusion in the OECD report noted above that the full integration of science and technology into the development process through the building of national capacities and coordinating domestic and international efforts through a set of key development missions is a major exciting task for the 1990s. 5/

Notes

1/ Percy S. Mistry, "Financing in the 1990s" in Co-operation for International Development, Robert J. Berg and David F. Gordon, eds. (London, Lynne Rienner, 1989).

2/ Linda C. Lim, "World economy" in Berg and Gordon, op. cit.

3/ Organisation for Economic Cooperation and Development, Development Co-operation: 1990 Report (Paris, 1990).

4/ Organisation for Economic Cooperation and Development, Scientific and Technological Co-operation with Developing Countries (Paris, 1985).

5/ Report of the Expert Meeting on the Role of Science and Technology in Development Cooperation with the Less Advanced Developing Countries in the 1990s, sponsored by DAC/OECD, May 1990. Unpublished paper.

Annex

UNITED NATIONS FUND FOR SCIENCE AND TECHNOLOGY FOR DEVELOPMENT: LIST OF PROJECTS AS OF 31 DECEMBER 1990

A. Ongoing

Africa

BDI/85/T01	Transfert et développement de technologie
IVC/81/T01	Haemostasis in Black Africans
MAG/89/E01	Mini-Hydro Power Plant in Adriantsemboka
RAF/81/T02	Lagos Plan of Action in Science and Technology
RAF/86/T01	International Consulting Consortium in Africa (ICCA)
RAF/87/T01	Field Testing and Research on ENDOD
RAF/88/T02	Maintenance of Scientific Equipment in the SADCC Countries
RAF/88/T03	Promotion of Small Tech-related Enterprises
RAF/90/T02	Biotechnology for Food Production
ZAM/87/T01	Industrial Application of Biotechnology
TOG/89/T01	Technology Incubation Centre

Asia

CPR/84/T01	Beijing National Food Technology Institute
CPR/84/T02	Computer-based Management Training Programme
CPR/87/T01	Drip Irrigation Technology
CPR/89/T01	Beijing International Conference on Technology Innovation
IND/89/T01	Technology Incubation Centre
INS/83/T01	Appropriate Technology for Rural Communities Phase II
MDV/82/T01	National Planning Capabilities in Science and Technology
PAK/80/T01	Development Centre for Silicon Technology
PHI/88/T01	Technological Business Incubator
RAS/85/T01	Strengthening Computer Faculty at AIT
RAS/90/T01	Management of Technology at AIT
THA/89/T01	Technology Incubation Centre

Latin America

COS/83/T01	Geothermal Resources
DOM/85/E01	Desarrollo Hidro-eléctrico del Río Ocoa
RLA/84/T01	Regional Non-Destructive Testing Network
RLA/89/T01	Inter-American Space Science and Technology Cooperation
URU/81/T01	Virus de Fiebre Aftosa en Carne
TRI/90/T01	Congress on the Iron and Steel Industry

Arab and Europe

POL/89/T01	Technology Incubator Centre
SUD/89/T01	CD-ROM Services
TUR/90/T01	Establishment of Technoparks in Turkey
YEM/84/T01	Establishment of an Oceanographic Institute
YEM/89/E01	Power System Loss Reduction Study

Interregional

INT/85/E03	International Training Programme in Coal Technology
INT/87/E02	Executive Level Seminar in Coal Technology
INT/89/T02	Endogenous Capacity in Science and Technology
INT/90/T01	Technology Rights Bank
INT/90/T02	Creative Funding for Environmentally Sound Technologies
INT/88/709	Technological Innovation and Entrepreneurship
INT/88/717	PANS on Selected New and Emerging Technologies
INT/88/706	Information System Guide for UNDP Field Offices

B. Pipeline projects

BHU/90/E01	Minihydro Power Station
CHI/90/T01	Technology Park at the University of Santiago
GRN/90/E01	OLADE - Solar Water Heaters
CUB/91/T01	Pilot Plant for Production of Silicon from Silica
IND/90/E01	Workshop on Renewable Energy
MEX/90/T01	Need Assessment for the Technology Park of Morelos
MON/91/T01	Data Bank for National Mineral Resources
PAK/90/T01	Science and Technology Seminar

PHI/90/T01	Science and Technology Referral Services for Journalists
RAF/87/T02	African Chairs of Technology
RAS/89/T01	Regional Software Centre at AIT
ROK/90/T01	Technology Incubator
STL/91/T01	National Workshop on Science and Technology
SUD/90/E01	Rural Energy Development
TUN/90/T01	National Technology Fund
UGA/90/E01	Geothermal Energy
YEM/90/T01	Volcanological Studies